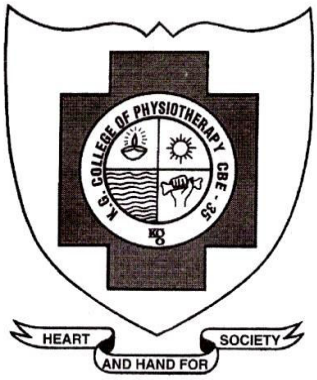
"EFFECT OF MCKENZIE POSTURAL CORRECTION AND DYNAMIC TRUNK MUSCLE ENDURANCE EXERCISES ON PAIN, DISABILITY AND TRUNK MUSCLE ENDURANCE IN CHRONIC POSTURAL LOW BACK PAIN"



REGISTER NO: 271410303

ELECTIVE: PHYSIOTHERAPY IN ORTHOPAEDICS

A DISSERTATION SUBMITTED TO THE TAMILNADU
Dr. M. G. R MEDICAL UNIVERSITY, CHENNAI.
AS PARTIAL FULFILLMENT OF THE
MASTER OF PHYSIOTHERAPY DEGREE
OCTOBER 2016

CERTIFICATE

Certified that this is the bonafide work of **Ms. P. Smitha** of K.G.College of Physiotherapy, Coimbatore submitted in partial fulfillment of the requirements for Master of Physiotherapy Degree course from the Tamil Nadu Dr. M. G. R Medical University under the **Registration No: 271410303** for the October 2016 Examination.

Date: Principal

"EFFECT OF MCKENZIE POSTURAL CORRECTION AND DYNAMIC TRUNK MUSCLE ENDURANCE EXERCISES ON PAIN , DISABILITY AND TRUNK MUSCLE ENDURANCE IN CHRONIC POSTURAL LOW BACK PAIN"

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Internal examiner

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ACKNOWLEDGEMENT

First of all, I praise **GOD**, the almighty, merciful and passionate, for providing me this opportunity and granting me the capability to proceed successfully.

At the very outset, I express my deepest sense of gratitude to our respected Chairman **Padmashree Dr.G.Bakthavathsalam,** Chairman K. G. Hospital, Coimbatore for allowing me to use facilities of the hospital and institution for this study.

I would like to express my deep thanks to our madam **Mrs. Vaijayanthi Mohandas,** Director of education, K. G. College of health sciences for her concern for the betterment of students.

I humbly express my sincere gratitude and special thanks to our Principal **Dr.B.Arun, MPT., Ph D.,** for his support, encouragement, valuable suggestions and guidance.

My special and sincere thanks to **Prof. Mohan Raj, MPT.,** Vice Principal, for rendering valuable suggestions, constant guidance and support for the progress of my work and fruitful outcome of this study.

I take this opportunity to express my profound gratitude and deep regards to my guide **Prof. S.R. Sathish Prabu , MPT.,** for his exemplary guidance and constant encouragement throughout the course of this thesis.

I express my sincere gratitude to **Prof .V. Mohan Gandhi, M.P.T.,** Chief Physiotherapist, K.G. Hospital, Coimbatore for his valuable support and guidance.

I extend my sense of gratitude to all **Faculty Members, Liberian** of K.G. College Of Physiotherapy and **Physiotherapist** in the Department Of Physiotherapy, K.G. Hospital for their priceless contribution in cultivating education and special skills in me which stands significant for my career.

I am obliged to offer my sincere thanks to all **My subjects** for having consented to participate in this study forgoing all suffering.

My deep humble sense of gratitude to my parents **S. Prasad, G. Snehalatha** and my brother **P. Vinu Shankar** for their unwarranted and conditional love and courage they have given me. They are the most important people in my world and I dedicate this thesis to them.

Last but not least, I submit my thanks to **My Friends** for their unwavering support, encouragement and love which helped me in doing my project and my studies as well.

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I. INTRODUCTION

Low back pain is the 20th century enigma which continues to be the major cause of disability and distress in large proportion of the adult population (Waddle, 1998). Low back pain is cluster of symptoms related to pain and discomfort arising from lumbar spine. (Chung et al., 2013; Kwon et al., 2011). Epidemiological data indicates an annual prevalence of about 39-54% and a life time prevalence of 60-65%. Prevalence rate of low back pain is 7% to 33% and the life time prevalence is nearly 85% (Walker, 2000). Researchers has found that about 70%-80% of individuals experienced this once in their life time. (Frank et al, 1996, Volin, 1997). In Indian population, low back pain prevalence has been found to range from 6.2% to 92%.

Low back pain affects the physiological and psychological aspects of an individual. (Grabiner et al., 1992). Low back pain causes limitation of activity in people younger than 45 years of age. Both gender are equally affected, some studies has identified that women especially who have more than two pregnancies have a high risk for low back pain. 78% of men and 89% of women are affected by Low back pain.

90% of the low back pain is mechanical in nature, only 10% have some specific pathology. Low back pain represent the leading musculoskeletal disorder which results in disability in individuals. (Jette et al., 1994). Disability following LBP is the major health problem in developing countries. It is one of the common condition which causes a sever health problem in developing countries. It accounts for serious job absenteeism, sick leave and reduced functional performance and emotional distress. (Airaksinen et al., 2006).

Physicians and therapists believe that Low back pain related disability must be viewed as a multi-factorial problem. Lumbar spine movement are combined movements, 80%-90% of the lumbar flexion and lumbar extension occurs in L4-L5 level and L5-S1 Level. The spinal stabilizing system was conceptualized by Panjabi in 1992 has constructed into three sub systems. 1) Spinal column providing intrinsic stability, 2) Dynamic stability by the spinal muscles 3) neural control require for stability and coordinating muscle responses. It has been proposed that the instability of the spinal segment occurs due to loss of control or excessive motion in the spinal segment's neutral zone which is associated with injury, muscle weakness and degeneration. (O'Sullivan et al., 1997). The muscle which stabilizes becomes weak due to pain and which results in recurrence of the

symptoms. There was a massive change in the cross sectional area of the Multifidus muscle within 24 hours after acute Low back pain onset (Hides et al, 1994). Deep stabilizing muscles become impaired which provides poor segmental stiffness and it predisposes to the lower back injury and pain. Muscle weakness results in pain as well as a decline in performance. The process of muscle weakness tends to cause more pain and there was sever weakening of the muscles in the spine (Carragee, 2006).

Back muscle endurance exercises are believed to augment muscle reactivation and recovery. Evaluating the endurance of trunk extensor muscles seems to have greater discriminative validity than evaluation of maximal voluntary contractile force. Specifically there is forthcoming evidence to suggest that the endurance training of low back extensors in chronic low back pain patients will be effective in reducing pain, disability and work loss and improve fatigue threshold and physical performances.

The rehabilitation goal is self- care with independence. Managing back pain is the costly method. Physiotherapy interventions like Cryotherapy, Thermotherapy, TENS, Ultrasound, SWD and traction are commonly recommended. (Foster et al., 1991, Li & Bombardier 2001.). Exercise therapy is found to be the effective way

to speedy recovery from Low back pain and help in strengthen the back and abdominal muscles. However in well define patients with low back pain, specific exercise intervention strategies have been recommended. Exercise of various types are been used in management of low back pain with varying report successes as they appear to be the central element in management of physical therapy with chronic low back pain.

One of the best forms of exercises approach which was used in the management of low back pain is McKenzie therapy. There are many studies which has documented the effectiveness of the McKenzie therapy on Low back pain. McKenzie therapy classifies low back pain based on three syndromes named as Postural, Dysfunction and Derangement. Postural syndrome is the most common causes for the low back pain. In postural syndromes, continues stress of soft tissues has been the cause for low back pain while maintaining certain postures or positions. When a normal joint is held at end range, noncontractile structures such as ligaments and joint capsules are “stretch” stressed i.e. tissue is normal but load is wrong. Symptoms do not persist once abnormal stretch stress removed and there will be no referred symptoms. Postural education is the best treatment for postural syndrome. Recent systematic review concluded that there is insufficient evidence to evaluate the effectiveness of

McKenzie method for patients with low back pain. A critical concern related to McKenzie method is that most trials to the date have not implemented appropriately.

Barr et al (2005) in their review on lumbar stabilization submitted that the multifidus and transverse abdominis muscles are major stabilizers of the spine. Some authorities suggests that for low back pain, muscles plays the role of potential source. They argue that the damage to the pain sensitive structures results from the failure of muscles to protect the passive structures from the excessive loading and it results in the production of pain.

Many researchers have concluded that the erector spinae muscle activity play a major role in low back pain. Evidences shows that the endurance exercises to these muscles play a major role in reducing the low back pain. Poor endurance of the trunk muscles induce strain on the passive structures of the lumbar spine which gradually result in low back pain. Furthermore deficiency of the endurance in muscles has been shown to be related to decreased proprioception awareness and reduced productivity in work.

Many clinical trials shows that the endurance exercises are effective for chronic low back pain individuals. The result of the trial suggests that intensive extension exercises are superior to using an exercise program with isometric back extension and abdominal

exercises. Furthermore there seems to be dearth of studies investigating the effect of the addition of back extensor muscle endurance exercise with the McKenzie protocol on patients with chronic low back pain.

Bering- Sorensen test of static muscular endurance(BSME) otherwise known as Sorensen test is a clinical tool used for the diagnosis of low back muscular endurance and it has been reported to be valid ,reliable, safe, practical, responsive, easily administered, inexpensive and there is a substantial quality of compiled data. Although Hansen described the best as a tool for evaluating back strength, studies subsequently established that it assesses isometric muscle endurance. The BSME has been used to evaluate back extensor endurance holding times in overseas populations in both patients and healthy subjects as well as in assessment of work ability and rehabilitation, most notable before and after the rehabilitation program and Using Sorensen test, some researchers have found endurance in holding time between subjects with chronic low back pain and individuals without low back pain. These findings seem to suggest that prolonged or recurrent back pain is associated with poor trunk extensor endurance.

The test has been studied to how well it detects associations of back function and low back pain. Studies published demonstrate that the test assesses the endurance of all the muscles involved in extension of the trunk, which include not only the Para spinal muscles, most notably the multifidus muscle but also the hip extensor muscles. The contribution of the Gluteus Maximus and hamstring muscles remains controversial. Bering Sorensen reported that a position- holding time less than 176 seconds predicted low back pain during next year, whereas position holding time greater than 198 seconds predicted absence of low back pain and a time less than 58 seconds shows a three times greater risk of low back pain compare to than 104 seconds.

Pain is defined as the subjective sensation which accompanies the activation of nociceptors (pain receptors) and which signal the location and strength of actual or potential tissue damage stimuli. Visual analog scale is used to measures the variations in back pain. The intensity of pain is recorder using a visual analogue scale ranging from no pain to maximum pain. Rozenberg N et al (2008) suggested that evaluation of patients according to visual analog scale is an accurate measurement.

Disability is described as the inability to participate in activities or tasks related to one's self, the home, work, recreation or the community in a manner or to the extent that the individual or the

community as a whole perceive as normal. The perceived activity limitation due to low back pain is measured by Oswestry Disability Index and it consists of 10 items with score ranging from 0 to 100% i.e no disability to severe disability. Disability Questionnaire has high test- retest reliability and construct validity.

1.1 NEED FOR THE STUDY

Low back pain is a common problem which affects the majority of the adults at least once in a life time. (Dunn et al., 2004). Management of low back pain ranges from non -surgical to surgical management. Multiple studies have attempted to identify effective non -surgical treatment approached for the management of low back pain which have been largely unsuccessful, resulting in array of disparate treatment recommendations in low back pain practice guidelines. (Hayden et al., 2005, Arnau et al., 2006). Recent evidences shows that exercises play a major role in the management of the low back pain.

Physiotherapist uses a wide variety of treatment for patients with low back pain. (Battie et al., 1994). It is also unclear if there is meaningful heterogeneity in the response to different physical therapy treatment options. Exercise therapy with McKenzie is a most popular form of therapy, although no sound randomized controlled trials have

been published to support the effectiveness of the method. Few literatures have addressed the benefits of McKenzie therapy separately and the benefits of endurance exercises separately. (Foster et al., 1999, Van Tulder et al., 2000). However there was a large gap found on effectiveness of McKenzie therapy when compared with the exercises.

1.2 PURPOSE OF THE STUDY

The purpose of the study is to find out the effect of Mckenzie postural correction and dynamic trunk muscle endurance exercises on pain, disability and trunk muscle endurance in chronic postural low back pain.

1.3 OBJECTIVES OF THE STUDY

- To find out the effect of Mckenzie postural correction on pain, disability and trunk muscle endurance in chronic postural low back pain.
- To find out the effect of dynamic trunk muscle endurance exercises on pain, disability and trunk muscle endurance in chronic postural low back pain.
- To compare the effect of Mckenzie postural correction and dynamic trunk muscle endurance exercises on pain, disability and trunk muscle endurance in chronic postural low back pain.

1.4 HYPOTHESIS

Null Hypothesis

- There is no significant difference found when comparing the Mckenzie postural correction and dynamic trunk muscle endurance exercises on pain, disability and trunk muscle endurance in chronic postural low back pain.

Alternate Hypothesis

- There is a significant difference found when comparing the Mckenzie postural correction and dynamic trunk muscle endurance exercises on pain, disability and trunk muscle endurance in chronic postural low back pain.

II. REVIEW OF LITERATURE

MCKENZIE THERAPY

Chidozie Emmanual Mbada et al., 2015,

Conducted a study on McKenzie protocol with 67 patients who were selected by randomized control trial. Study was conducted for 8 weeks on patients with low back pain to know the consequences of back pain and fear avoidance belief behavior in patients. The experimental group has better effect with McKenzie. The study suggests that McKenzie protocol have comparable effect on beliefs about the consequences of back pain and fear avoidance belief behavior in patients with low back pain.

Mohammeed Shariful Islam et al., 2015

Conducted a study on McKenzie therapy and conventional therapy with 100 subjects who are randomly selected with pain and disability in low back pain, found out that McKenzie therapy was statically significantly more effective than other treatments in reducing pain and disability at short term follow up. They suggest that the McKenzie therapy provides on an average 8.6 point greater short term pain reduction (pain measured on a 0-100 point scale) than other conservative treatments and can be concluded that McKenzie

approach is very effective in treating patients with postural low back pain.

Garcia A N et al.2013

Study was conducted to know the effect of McKenzie exercise on chronic low back pain of 148 patients with 4 week treatment program who are selected by randomized control trial and was based on back school or McKenzie principles. The result of the study supports the basic use of McKenzie method was slightly more effective than back school method for disability but not for pain intensity immediately after treatment in participants with chronic low back pain.

Saravanan Kuppuswamy et al., 2013

They conducted the study by single blinded randomized control trial of 6 weeks with 30 physically active subjects of age group 20 to 65 years to know the effectiveness of McKenzie exercise in subjects with chronic nonspecific low back pain. McKenzie approach is one of the most frequently used types of physiotherapy for back pain and people are satisfied with McKenzie exercises because a more “hands on” approach as it has been found previously to be related to higher

patient satisfaction and have a positive effect on pain, disability and trunk mobility.

Tom Peterson et al., 2002

Study conducted with a randomized controlled comparative trial with an 8 month follow up period with 260 patients for 8 weeks treatment period to know the effectiveness of McKenzie method and intensive dynamic strengthening exercise in patients with sub-acute and chronic low back pain. The McKenzie method shown a favor of reduction in disability. So, the results of the study shown that McKenzie method and intensive dynamic strengthening exercise both have an equal effect on the treatment of sub-acute or chronic low back pain.

DYNAMIC ENDURANCE EXERCISE

Chidozie Emmanual Mbada et al.,2015

Study conducted to know the relation of the McKenzie protocol in combination with static or dynamic back extensors endurance on fear avoidance behavior, pain self-efficacy belief and back pain consequences belief respectively in low back pain patients with 67

subjects who were collected by randomized controlled trial and gave treatment for 8 weeks. The results shown that McKenzie protocol have a comparable significant effect on beliefs about the consequences of back pain and fear avoidance belief behavior in patients with low back pain.

Sevtap Gunay et al., 2014

They conducted study to know the effect of endurances training which was performed by 63 patients with chronic low back pain for 6 weeks and the results of the study suggested that the trunk endurance training program has increased endurance timing and endurance training may help to reduce risk of lowback pain and disability.

Kulandaivelen.S et al., 2014

Study conducted on the evidence based core stabilization could be used for improving the endurance of the low core endurance individuals for 6 weeks duration. The study results suggested that the evidence based core stabilization could be used for improving the endurance of low core endurance individuals.

Bala K et al., 2012

Conducted a study to know the endurance training of the trunk extensors muscles and general mobility spinal stretching with 38 subjects of both gender are selected. The results of the study shown

that the endurance training of the trunk extensors muscles and general mobility spinal stretching are equally effective in reducing pain and increasing endurance in subjects with non -specific sub- acute low back pain. Reduction in pain may be due to the gain in endurance and strength of back extensor muscles following training.

Babatunde O.A.Adegoke et al., 2007

Conducted study on the poor endurances for 42 subjects, once daily 4 times a week for 6 weeks. The results of the study shown that the poor endurance of trunk extensors has not only been implicated in the etiology of low back pain. This exercises protocol may hence find relevance in programmes designed to prevent low back pain.

Beverley chok et al., 1999

Conduced study on the endurance training of the trunk extensors in reducing the pain in the short term in subjects with subacute low back pain. The results suggested that the endurance training of the trunk extensors in reducing the pain in the short term in subjects with sub- acute low back pain, shown that muscle endurance exercise not only reduce the aggravate pain generally but it also helps to relieve pain and bring about earlier restoration of back function; atleast in short term.

SORENSEN TEST

Rafael de Souza Petersen et al., 2014

Study conducted on the low back pain characterized by muscle resistance and occupational factors associated with nursing, in which 48 subjects was participated and all underwent the Sorensen test. The results of the Sorensen test were effective and use of the test is valid because test uses the individuals own body weight to create the postural resistance.

S. Alvarez- Alvarez et al., 2013

Study conducted on the kinesio tape on 99 patient's shows that there is an improvement in the endurance of the extensor muscle of the trunk obtained using Biering Sorensen test.

Yasin Tekin et al., 2009

Study conducted on the Biering Sorensen test is an isometric back endurance test with 105 male coal miners participated in the study. The mean time of biering Sorensen test of the subjects with or without low back pain was 99.9 ± 19.8 and 128.6 ± 15.2 s, respectively. The differences between the subjects with and without low back pain were statically significant ($p < 0.001$). Turkish coal miners have low mean back extensor endurance times. The study results suggested that the Biering Sorensen test had a good discriminative ability in study group. Thus trunk muscle endurance training exercise therapy may be effective.

Christophie Demoulin et al.,2006

Conducted study on the Sorensen test for spinal evaluation allows for a rapid, simple and reproductive evaluation of the isometric endurance of the trunk extensor muscles. The study shown significant improvement in the discriminative between healthy individuals and patients with low back pain and may predict the occurrence of low back pain in the future.

CHRONIC POSTURAL LOW BACK PAIN

Hamada E Seif et al., 2015

Study conducted on the effect of stretching hamstring, gastrocnemius, illiopsoas and back muscles on pain and functional activities in patients with chronic low back pain with 40 patients states that chronic low back pain is define as back pain lasting more than 12 weeks. Over 70% of adults have atleast one episode of low back pain in their life time. One of the important risk factor of low back pain is weakness of superficial trunk and abdominal muscles and the lumbar muscle activity of patients with low back pain is low compare to health subjects.

Emiliano Neves Vialle et al., 2014

Study conducted on chronic low back pain states that low back pain is considered a public health problem worldwide and main cause of visiting doctors and time off work. The author reaffirmed the

relationship between the low back pain, musculature and flexibility demonstrating the large intra-articular and postural relationship in the source of low back pain.

Kumar A et al., 2011

The study conducted on effectiveness of trunk proprioceptive neuromuscular facilitation on chronic low back pain with 30 male patients states that back pain effects millions of people and remain most common cause of time off work. Back pain has lifetime prevalence in general population approaches 85% with 2 to 55 peoples affected yearly and 80% of patients report recurrent episodes.

Thiago. H. Oliveira et al., 2011

The study conducted on the patients in treatment of chronic low back pain with 100 subjects. They states that low back pain affects 70 to 85% of population and primary cause of disability and job absence. The low back pain results in both direct (e.g. Cost related to the treatment) and indirect cost (e.g. Low productivity) to individuals and society.

A.F.Mannion et al., 2001

They conducted study on the comparison of three active therapies for chronic low back pain over 148 patients states that musculoskeletal disorder especially low back pain are the most common cause of chronic incapability in industrialized countries and chronic low back pain is typically defined as low back pain lasting longer than three months represents particularly costly socio medical problem and long term absences of work and need for the social support.

VISUAL ANALOGUE SCALE

Kumar Amit et al ., 2013

They conducted study on the trunk muscle stabilization exercises and general exercise in recurrent nonspecific low back ache. Visual analogue scale was used to measure pain on 80 subjects with low back pain. They states that VAS was considered as the most appropriate and yield reliable and valid data for pain. The calculated t value for the VAS showed a significant variation at p=0.00.

Yogita verma et al., 2013

The study conducted on 30 subjects with chronic low back pain participated in the randomized clinical trial. Pain levels were measured using visual analogue scale shown, it is a reliable and valid instrument used to assess pain intensity and is opted as the outcome measure

based on its ability to detect immediate changes in pain. The result shown a significant pain relief in both the groups using VAS .

OSWESTRY DISABILITY INDEX

Nadia Mohamed Taha et al., 2015

Study conducted on the chronic low back pain using oswestry disability index on 33 adult subjects as to know the percentage of disability. Oswestry disability index is considered as the gold standard for assessing the disability level in back pain. The reliability of oswestry disability index was assessed in the present study shown excellent reliability.

Laura schembri et al. 2014

Study conducted on the value of core training versus traditional strengthening exercise on low back pain with 120 individuals used oswestry disability questionnaire as outcome measure. Oswestry disability questionnaire is a valid tool that is designed to assess the patient's functional level or disability and provide quantitative data that are suitable for quality assurances and research purposes.

Adelaide Maria Castro Sanchez et al., 2012

Study conducted on disability and pain on chronic non- specific low back pain used oswestry disability questionnaire to assess

disability. The results of the study shows that oswestry disability questionnaire as significant at a two sided significant level.

III. METHODOLOGY

3.1 STUDY DESIGN

The study design is a quantitative study design and in that this study uses Pre-test and post- test experimental study design.

3.2 STUDY SETTING

Department of physiotherapy, K .G. Hospital, Coimbatore.

3.3 STUDY DURATION

Study was conducted for six months duration and individual patients underwent treatment for 6 weeks.

3.4 SAMPLING METHOD

The participants are recruiting from the employees of KG iSL, a software company with more than 2000 employees. 112 patients who complains of low back pain who visit the physiotherapy department during the period of the study with the orthopedician referral were assessed individually, from that 60 patients with postural back pain were selected by systematic random sampling method based on the predetermined criteria. 40 patients who given concern to participate in the study were included after obtain a written consent form from individual participation. A computer generalized randomized table of numbers were created prior to the study to determine the randomization scheme with 20 patients in each group. All the participants were divided into two equal groups with 20 patients in each group.

3.5 SELECTION CRITERIA

Inclusion Criteria:

1. Chronic low back pain (More than 8 week)
2. VAS scale range between 5 – 8.
3. Age 21 -- 35years.
4. Both sexes are included.
5. Localized and Intermittent pain under prolonged, static end-range postures (usually flexion -- Poor lumbar spine Posture)

6. No loss of Lumbar ROM and absence of deformity

7. Patients fulfilling McKenzie's lumbar postural syndrome criteria.

- No reproduction of the pain in repeated movements test.
- Reproduction of the pain in sustained position or posture test.
- No progressive worsening and no rapid changes in symptoms.

8. Medium and less than Medium grade performance in Sorensen Trunk muscle endurance test.

Exclusion Criteria:

1. Patient with radiculopathy and neurological deficit.

2. Patient where no movement or position lessens their symptoms.

3. Has been diagnosed with a systemic inflammatory condition such as lupus and rheumatoid arthritis.

4. Spine fractures and spinal surgery.

5. Current pregnancy.

6. Diagnosed having tumor, infection etc.

7. Had any contra-indications to exercise therapy(e.g.: uncontrolled hypertension, previous myocardial infarction,

cerebrovascular diseases, peripheral vascular diseases, respiratory disorders)

8. Patients receiving medications other than standard dosage of analgesics and non- steroidal anti-inflammatory drugs.
9. Patient with bony anomalies.
10. Has a diagnosis of a psychological illness.

3.6 VARIABLES

Independent variables

Group A

- Mckenzie postural correction exercise with posture education and Dynamic endurance exercise training for trunk extensors.

Group B

- General exercises and postural correction education.

Dependent variables

- Pain
- Muscle endurance
- Functional disability

3.7 OPERATIONAL TOOLS

- VAS scale

- Oswestry disability index
- Modified Sorensen test

3.8 STUDY PROCEDURE

After obtaining the ethical approval from ethical committee, subjects who were visiting the outpatient department of physiotherapy, K.G.Hospital with chronic postural low back pain were recruited for this study. A clear explanation about the study was given to all the patients and they were included based on the inclusion and exclusion criteria. As informed consent was obtained from all the participants and they were allowed to withdraw from the study at any point of the time in case of any discomfort.

After obtained consent form, all subjects undergone through physical examination.

Following the assessment patients present values were assessed using VAS, Modified Sorensen test and Oswestry disability index.

40 subjects with chronic low back pain were selected and divided into 2 groups, with 20 subjects in each group.

Group A

1. McKenzie Postural Correction and Posture education

Procedure:

- Patient adopts the posture that produces their symptoms.
- Physiotherapist instructs patient how to abolish symptoms by correcting the posture and provides explanation on the mechanism that produces pain of postural origin.
- Attainment of the corrected posture is taught through the use of the "slouch-overcorrect" exercise.
- Patients are taught how to maintain the corrected posture through the use of a Lumbar roll and actively when a lumbar roll can-not be used.
- Consequences of postural neglect are discussed.

a) Mckenzie postural correction:

Proper sitting poster is taught as follows:

- Patient is asked to assume an over corrected sitting posture by fully retracted head and lordotic lumbar spine.
- Then relax to 10% normal erect sitting posture.

The benefits of assuming the over corrected posture is:

- Patient develops kinestic awareness.

- Over correction is so awkward that normal sitting posture doesn't seems so strange, something that keeps patient from sitting up.

b) Posture education:

- Patient are adviced to maintain the correct lumbar posture while sitting.
- The drawbacks of neglecting the correct posture are cleared to the patient.
- In addition to education in proper sitting posture, a lumbar support will enhance compliance.
- Frequent self correction and evaluation should be done.
- Get feedback with the help of a mirror kept in front of the patient.

2) Dynamic endurance exercise training for trunk extensors

Procedure:

- Subject lying in prone position with both arms by the sides of the body and lifting the head and trunk off the plinth from neutral to extension.

- Subject lying in prone position with the hands interlocked at the occiput so that shoulders are abducted to 90° and the elbows flexed, and lifting the head and trunk off the plinth from neutral to extension.
- Subject lying in prone position with both arms elevated forwards, and lifting the head, trunk and elevated arms off the plinth from neutral to extension.
- Subject lying in prone position and lifting the head, trunk and contralateral arm and leg off the plinth from neutral to extension.
- Subject lying in prone position with both shoulders abducted and elbows flexed to 90° and lifting the head, trunk and both legs (with knees extended) off the plinth.

Exercise Dosage and Progression:

All subjects began the exercise training programme with the first exercise position, but they progressed to the next exercises at their own pace when they could hold a given position for 10 seconds and perform 25 repetitions (with a 3 second rest between efforts). On reaching the fifth progression, they continued with the fifth progression until the end of the exercise programme.

Group B:

1. Postural correction education and general exercises

a) General exercises

1. Alternate knee to chest: Patient lie down on their back and clasp their hands behind the thigh and pull it towards their chest. Keep the opposite leg flat. Then switch the legs.
2. Straight leg raising: Patient lie down on their back and raise leg keeping knee straight. Slowly lower the leg to the floor and repeat on opposite leg.
3. Pelvic bridging: Patient lie down on their back and feet are flat on the surface and knees are bent. Keep legs together and arms by the side and slowly lift the buttock off the floor as far as possible without straining and lower the buttock.
4. Alternate arm –leg extension: Patient on 4- point kneeling position attains alternate arm –leg extension.

The exercise was done with 3 sets of 15 repetitions with an interval of 30 seconds between intervals and interval of 60 seconds between sets. Each group consists of 5 min warm up and cools down phase (stretching exercise for low back, hamstrings and calf muscles)

b) Postural correction education:

a. Pelvic position.

2. Lumbar and thoracic spine position.

3. Shoulder position.

4. Core stabilization.

5. Eliminate low back discomfort.

6. Eliminates shoulder –arm- hand discomfort.

After 6 weeks of treatment, all subjects from 2 groups were involved for the post test assessment.

3.9 STATISTICAL TOOL USED

Statistical analysis was done by using students 't' test. Paired 't' test was used to find out the improvement within the group. Unpaired 't' test was used to find out the difference between two groups.

Paired ' t' test

The intra group analysis of results were done with Paired ‘ t’ test with 5% level of significance. Statically analysis is done using dependent ‘ t’ test.

$$t = \frac{\bar{d}}{S_d / \sqrt{n}}$$

$$s_d = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

Where,

d = difference between the pre - test versus post - test

d = mean difference

n = number of observations

s = standard deviation

To compare experimental group and control group

Statistical analysis is done using independent 't' test

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\left(\frac{(N_1 - 1)s_1^2 + (N_2 - 1)s_2^2}{N_1 + N_2 - 2}\right)\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

Where,

S = Combined standard deviation

S_1 and S_2 = Standard deviation of experimental and control group respectively.

d_1 and d_2 = Difference between initial and final readings in control group and experimental group respectively.

n_1 = Number of patients in control group

n_2 = Number of patients in experimental group

X_1 and X_2 = Mean of control group and experimental group respectively.

$$s_d = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n - 1}}$$

Level of significance = 5%

IV. DATA ANALYSIS AND INTERPRETATION

TABLE I

VISUAL ANALOGUE SCALE FOR PAIN

PAIRED 't' TEST OF GROUP A – (MCKENZIE EXERCISE AND DYNAMIC ENDURANCE EXERCISE FOR POSTURAL CHRONIC LOW BACK PAIN)

S.NO	VAS	MEAN	S.D	MEAN DIFFERENCE	PAIRED t TEST
1.	Pre test	6.25	1.07	4.9	21.47
2.	Post test	1.35	0.81		

The table I shows the analysis of Visual Analogue Scale in Group A. Using paired 't' test with 20 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.093 which was lesser than the calculated 't' value 21.47 . The result shows that there was marked difference between pretest and posttest values.

GRAPH I

VISUAL ANALOGUE SCALE

Paired ‘t’ test of Group A

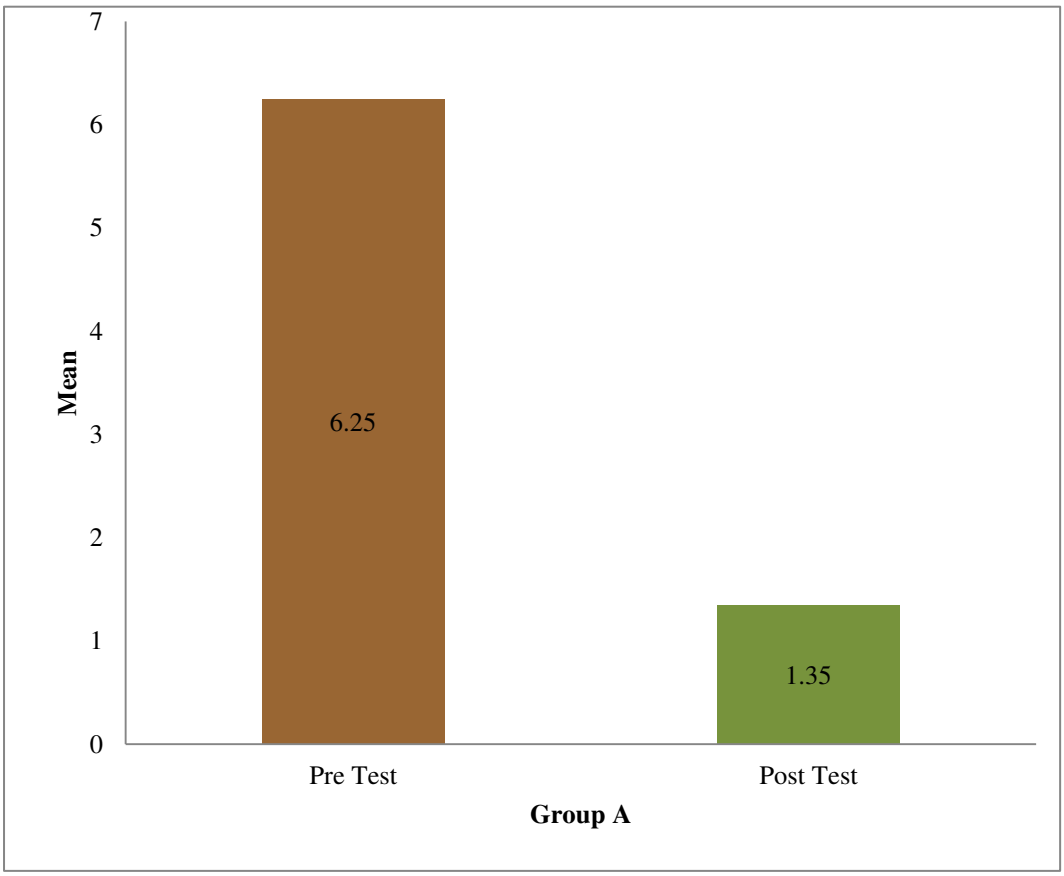


TABLE II

VISUAL ANALOGUE SCALE FOR PAIN

PAIRED 't' TEST OF GROUP B – (POSTURAL CORRECTION EDUCATION AND EXERCISE PROGRAM FOR POSTURAL CHRONIC LOW BACK PAIN)

S.NO	VAS	MEAN	S.D	MEAN DIFFERENCE	PAIRED t TEST
1.	Pre test	6.35	0.93	3.65	17.49
2.	Post test	2.70	0.98		

The table II shows the analysis of Visual analogue scale in Group B. Using paired 't' test with 20 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.093 which was lesser than the calculated 't' value is 17.49 . The result shows that there was marked difference between pretest and posttest values.

GRAPH II

VISUAL ANALOGUE SCALE

Paired 't' test for Group B

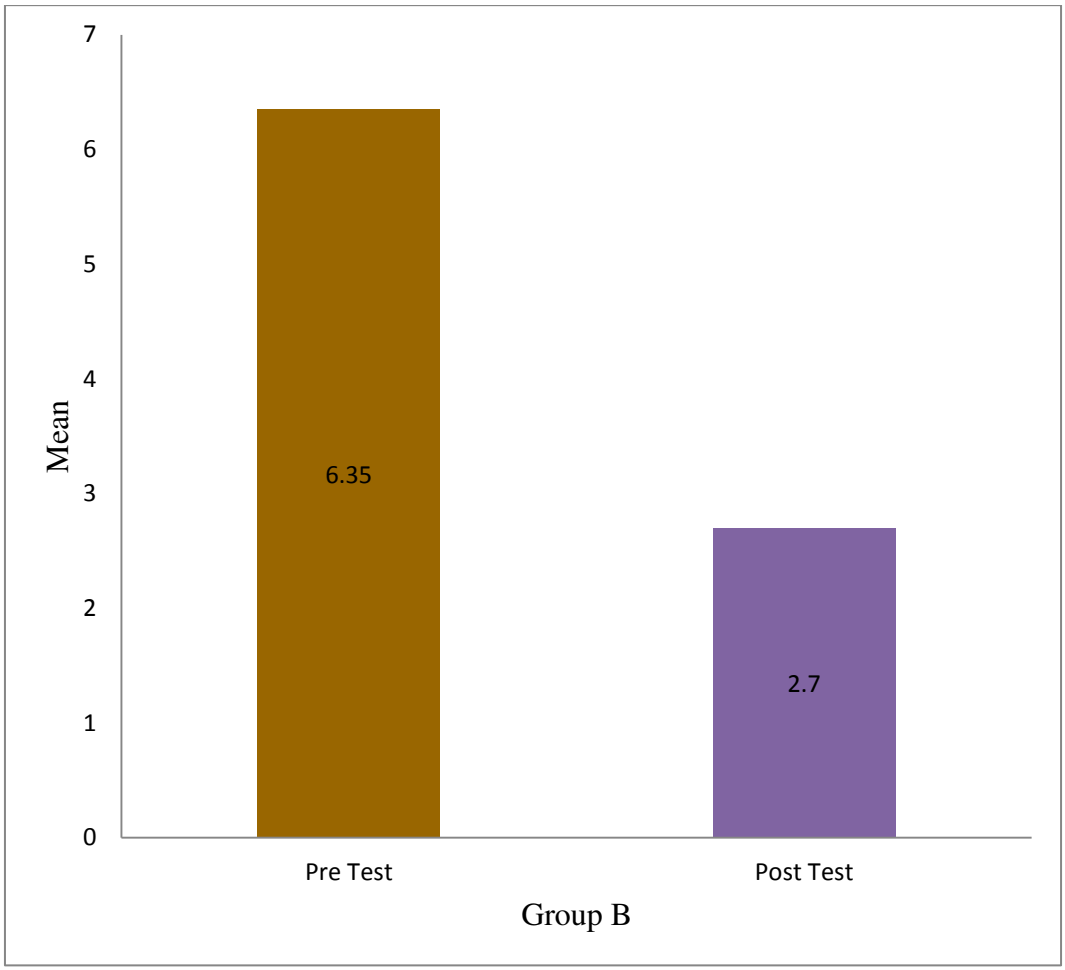


TABLE III

VISUAL ANALOGUE SCALE FOR PAIN

UNPAIRED 't' TEST FOR GROUP A AND GROUP B

S. NO	VAS	MEAN	S.D	MEAN DIFFERENCE	UN-PAIRED t TEST
1.	Group A	1.35	0.81	-1.35	4.75
2.	Group B	2.70	0.98		

The table III shows the analysis of visual analogue scale in Group A and Group B.

Using unpaired 't' test with 20 degrees of freedom and 0.05% as a level of

Significance, the table 't' value is 2.042 which was lesser than the calculated 't'

Value is 4.75. The result shows that there was marked difference between Posttest values of both the groups.

GRAPH III

VISUAL ANALOGUE SCALE

Unpaired ‘t’ test of Group A and B

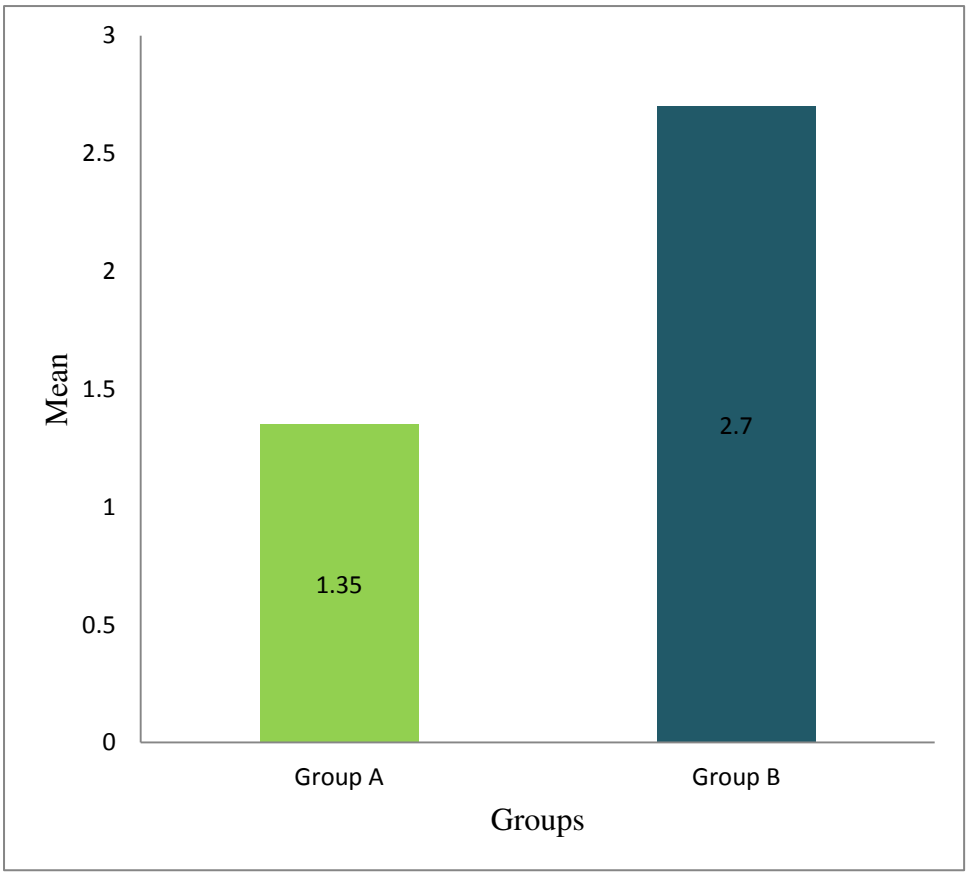


TABLE IV

SORENSEN TEST FOR ENDURANCE

PAIRED 't' TEST OF GROUP A – (MCKENZIE EXERCISE AND DYNAMIC ENDURANCE EXERCISE FOR POSTURAL CHRONIC LOW BACK PAIN)

S.NO	SORENSEN TEST	MEAN	S.D	MEAN DIFFERENCE	PAIRED t TEST
1.	Pre test	68.05	5.48	-60.7	25.02
2.	Post test	128.75	11.48		

The table IV shows the analysis of Sorensen test in Group A. Using paired 't' test with 20 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.093 which was lesser than the calculated 't' value is 25.02 . The result shows that there was marked difference between pretest and posttest values.

GRAPH IV

SORENSEN TEST

Paired 't'test of Group A

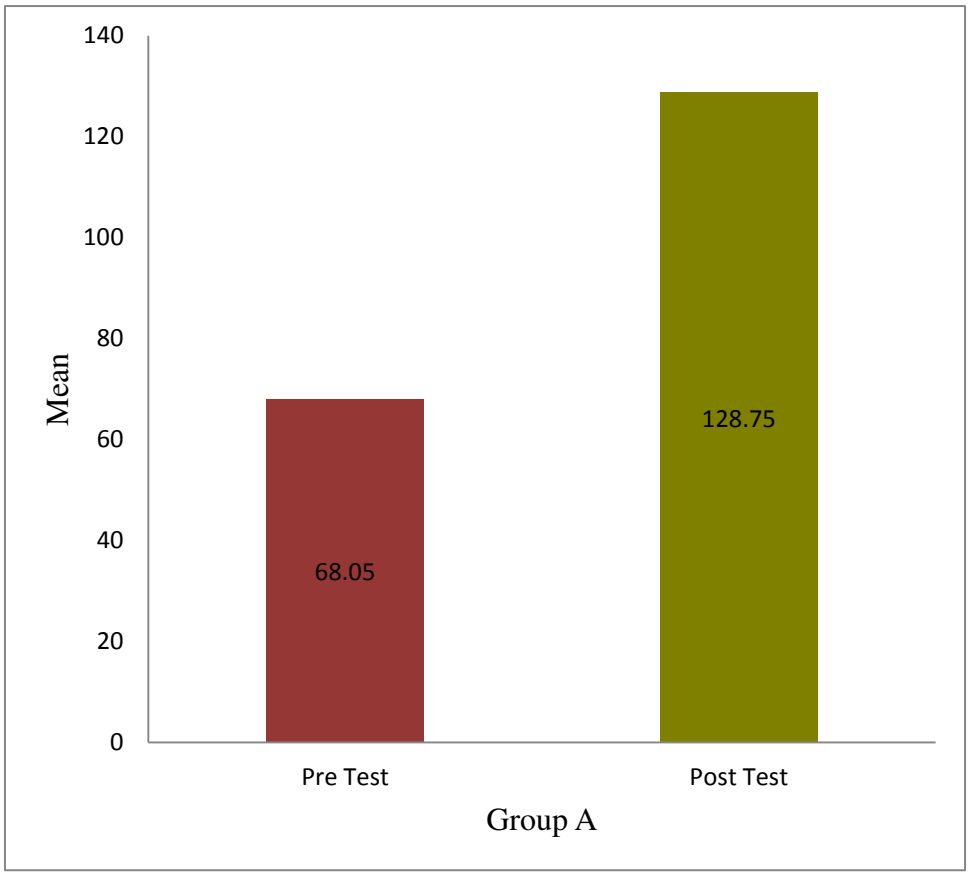


TABLE V

SORENSEN TEST FOR ENDURANCE

PAIRED 't' TEST OF GROUP B – (POSTURAL CORRECTION EDUCATION AND EXERCISE PROGRAM FOR POSTURAL CHRONIC LOW BACK PAIN)

S.NO	SORENSEN TEST	MEAN	S.D	MEAN DIFFERENCE	PAIRED t TEST
1.	Pre test	67.90	3.71	-35.55	19.11
2.	Post test	103.45	7.75		

The table V shows the analysis of Sorensen test in Group B. Using paired 't' test with 20 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.093 which was lesser than the calculated 't' value is 19.11. The result shows that there was marked difference between pretest and posttest values.

GRAPH V

SORENSEN TEST

Paired ‘t’ test for Group B

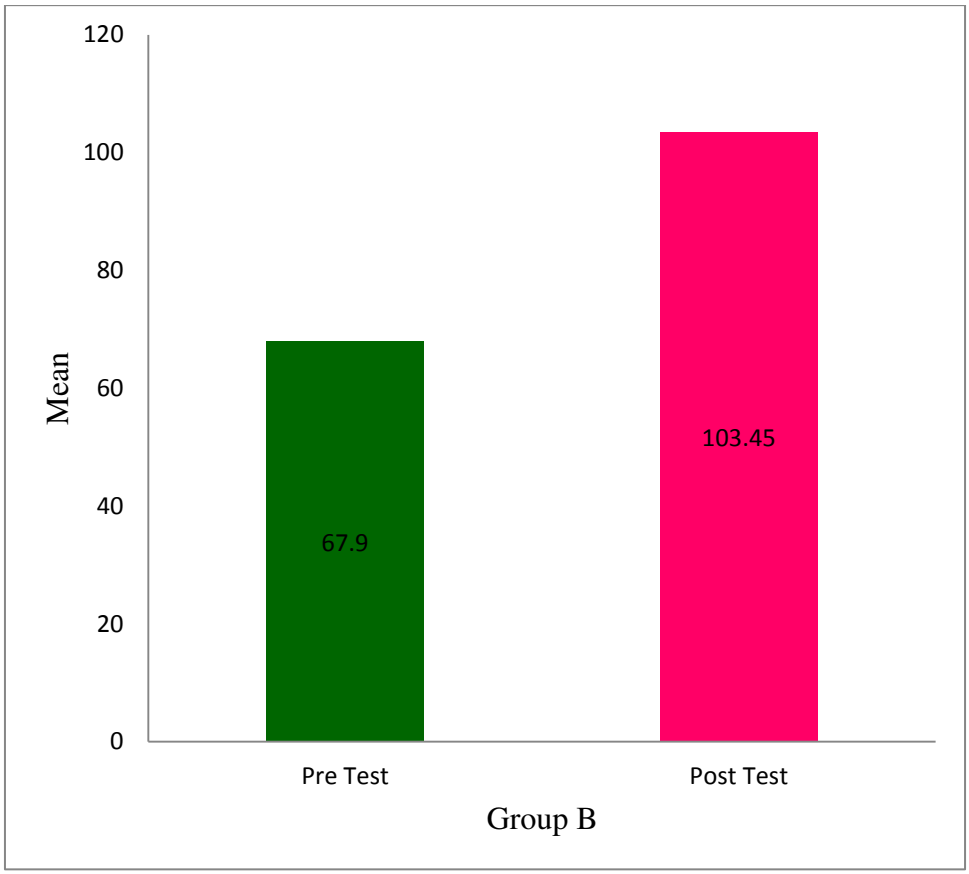


TABLE VI

SORENSEN TEST FOR ENDURANCE

UNPAIRED 't' TEST FOR GROUP A AND GROUP B

S. NO	SORENSEN TEST	MEAN	S.D	MEAN DIFFERENCE	UNPAIRED t TEST
1.	Group A	128.75	11.48	25.3	8.17
2.	Group B	103.45	7.75		

The table VI shows the analysis of Sorensen test in Group A and Group B. Using unpaired 't' test with 20 degrees of freedom and 0.05% as a level of significance the table 't' value is 2.042 which was lesser than the calculated 't' value is 8.17.

The result shows that there was marked difference between posttest values of both the groups.

GRAPH VI

SORENSEN TEST

Unpaired ‘t’ test for Group A and B

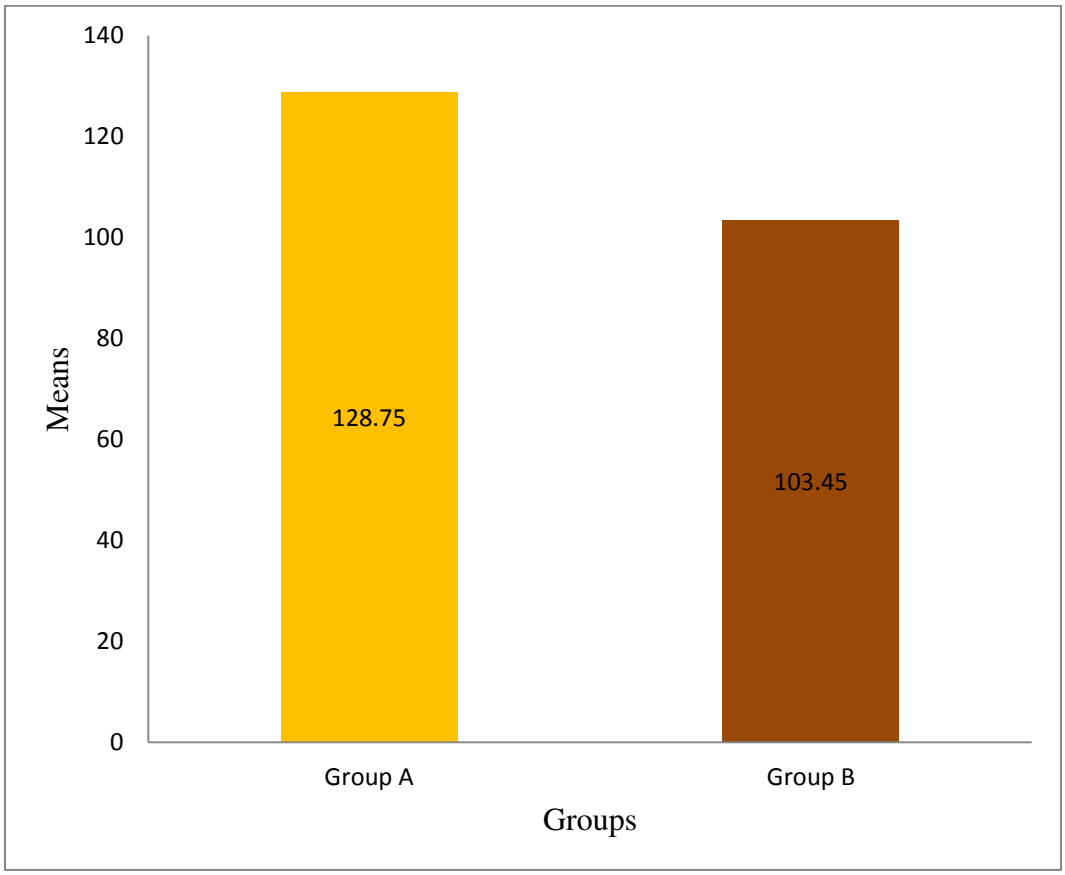


TABLE VII

OSWESTRY DISABILITY INDEX

PAIRED 't' TEST OF GROUP A – (MCKENZIE EXERCISE AND DYNAMIC ENDURANCE EXERCISE FOR POSTURAL CHRONIC LOW BACK PAIN)

S.NO	ODI	MEAN	S.D	MEAN DIFFERENCE	PAIRED 't' TEST
1.	Pre test	26.30	2.54	17.7	26.47
2.	Post test	8.60	2.76		

The table VII shows the analysis of oswestry disability index in Group A. Using paired 't' test with 20 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.093 which was lesser than the calculated 't' value is 26.47. The result shows that there was marked difference between pretest and posttest values.

GRAPH VII

OSWESTRY DISABILITY INDEX

Paired 't' test for Group A

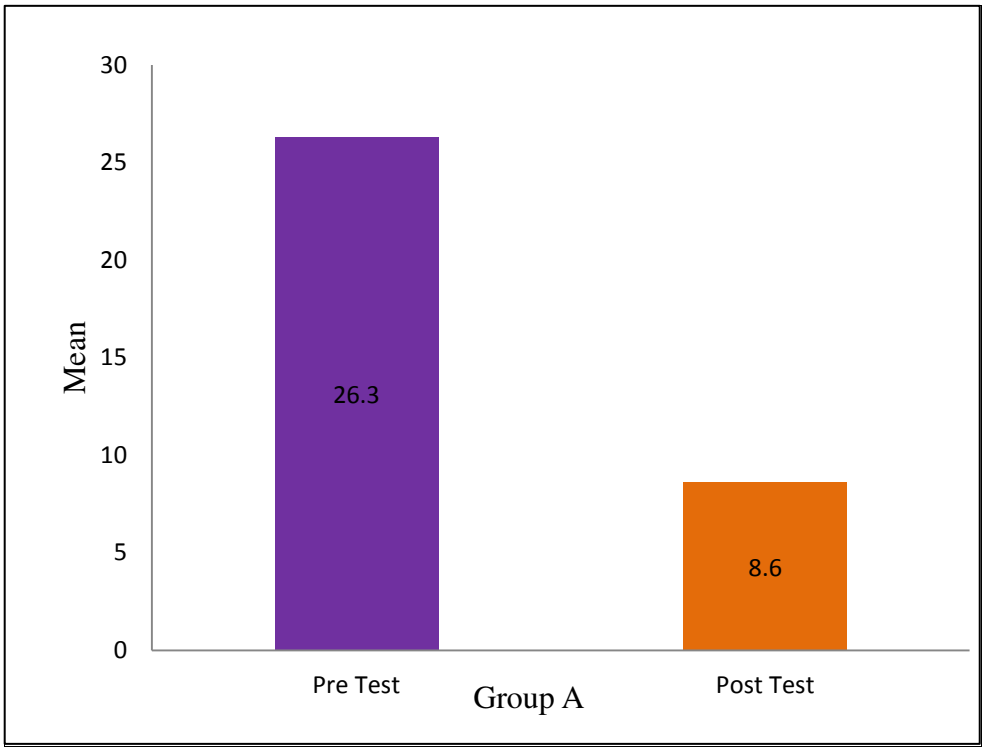


TABLE VIII

OSWESTRY DISABILITY INDEX

PAIRED 't' TEST OF GROUP B – (POSTURAL CORRECTION EDUCATION AND EXERCISE PROGRAM FOR POSTURAL CHRONIC LOW BACK PAIN)

S.NO	ODI	MEAN	S.D	MEAN DIFFERENCE	PAIRED 't' TEST
1.	Pre test	26.10	2.79	9	14.34
2.	Post test	17.10	2.31		

The table VIII shows the analysis of Oswestry disability index in Group B. Using paired 't' test with 20 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.093 which was lesser than the calculated 't' value is 14.34. The result shows that there was marked difference between pretest and posttest values.

GRAPH VIII

OSWESTRY DISABILITY INDEX

Paired 't'test for Group B

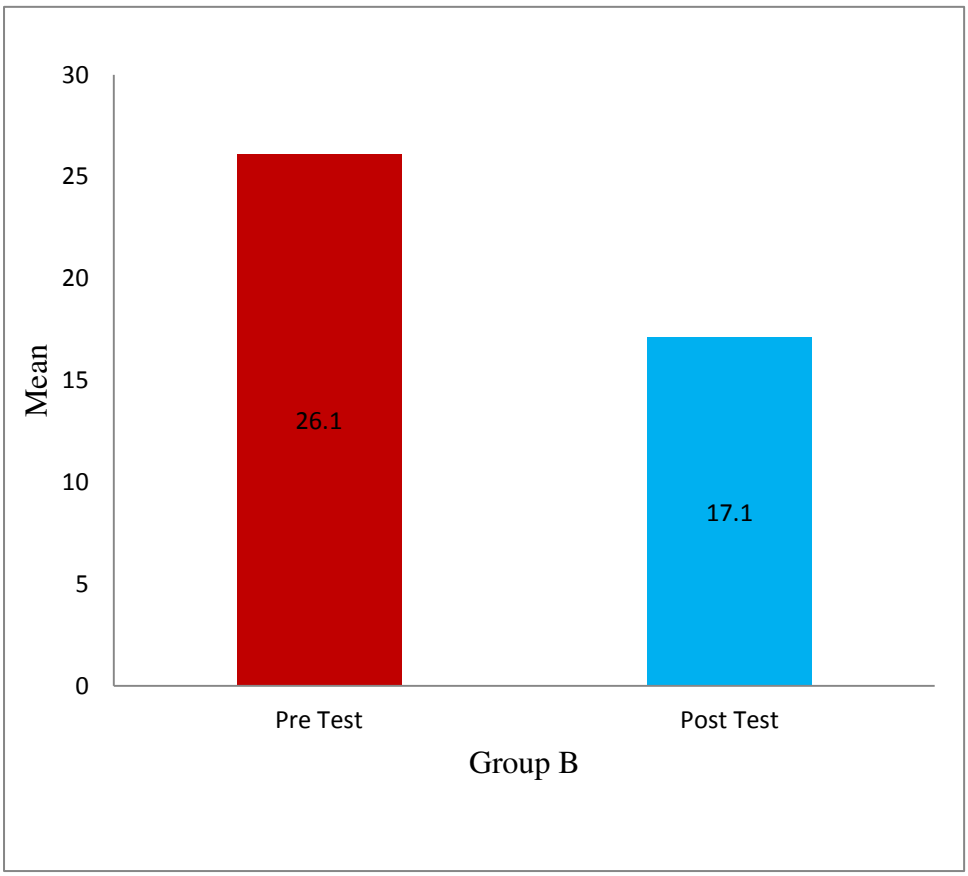


TABLE IX

OSWESTRY DISABILITY INDEX

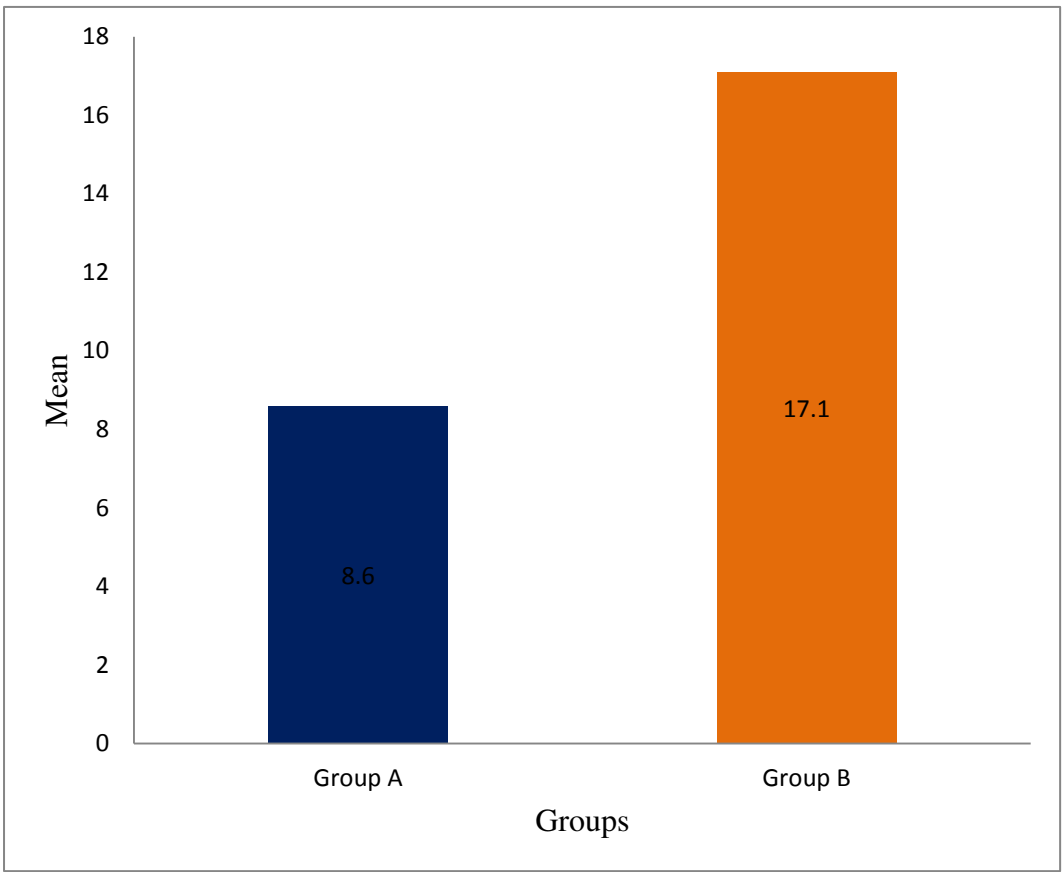
UNPAIRED 't' TEST FOR GROUP A AND GROUP B

S.NO	ODI	MEAN	S.D	MEAN DIFFERENCE	UNPAIRED t TEST
1.	Group A	8.60	2.76	-8.5	10.55
2.	Group B	17.10	2.731		

The table IX shows the analysis of Oswestry disability index in Group A and Group B. Using unpaired 't' test with 20 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.042 which was lesser than the calculated 't' value is 10.55. The result shows that there was marked difference between posttest values of both the groups.

GRAPH IX

OSWESTRY DISABILITY INDEX
Unpaired 't' test for Group A and B



V. DISCUSSION

Low back pain is one of the commonest conditions which frequently seen in working population. Chronic low back pain affects 50% of general population. (Rozenberg, 2008). It is estimated that over 70% of the adults have atleast one episode of LBP in their lifetime. (Lawrence et al., 2006). Back pain affects up to 75% of adult population at some time of their lives and this problem accounts for 15% of sick leaves. (Wolsko et al., 2003).

The prevalence of work related musculoskeletal disorders is increasing among computer users throughout the world (Luis et al., 2003; Arun Vijay., 2013). Appropriately 76% of computer professionals from India reported musculoskeletal disorders in various epidemiological studies (Talwar R et al., 2009; Bhanderi D et al., 2007; Sharma A et al., 2006; Bakhtias C S et al., 2003)

Hence the workers involved in IT profession will have high prevalence of work related musculoskeletal disorders and that may be associated with work style as one of the risk factors in development

of musculoskeletal discomfort (Deepak Sharan et al., 2011). Epidemiological studies report that life time incidence of low back pain in industrial workers to be approximately 60% (Sevensson and Anderson ., 1983; Lee et al., 2001).

Low back pain often results with deconditioning of physical and mental health of the individual which result in vicious cycle. This vicious circle was characterized with reduced physical performance, exacerbated nociceptive sensation, impaired social integration, psychological issues and work disability. (Frank et al., 1996). Deconditioning involves stiffness in the lumbar region with reference to decline in the strength of the muscles around the lumbar spine with reduced endurance. (Mayer et al., 1985).

Causes of low back pain are combinations of many factors include improper posture, overloading of the back, immobility and trunk muscle weakness. One of the primary cause for back pain is poor sitting posture over long period (Roffey DM et al.,2010; de Schepper E I et al., 2010). Many sedentary workers keep a markedly curved back posture with low muscle activity during sitting which may weaken lumbar muscle strength (O'Sullivan PB et al., 2006; Mork PJ et al., 2009) and decrease in muscle strength and function which can increase the prevalence of low back pain. A number of studies have suggested that prolonged sitting in poor posture could be

a risk factor for the development of low back pain (Corlett., 2006; Pope et al., 2002). Dicomfort is considered to be related with sitting postural changes (Fenety and Walker , 2002; Vergara and Page, 2002; Liao and Drury , 2000)

Poor trunk muscles may induce strain on the passive structures surrounding the lumbar spine, eventually lead to low back pain. (Chok et al., 1999). Recent evidences suggest that the muscle endurance is very low in patients with low back pain when compared individuals without low back pain. Trunk fatigue with prolonged loading leads to loss of control and precision which may predispose an individual to develop low back pain. (Chok et al., 1999).

The back extensor muscles are considered to be the postural muscles that aid in maintaining standing posture and controlling lumbar forward bending (Calliet R et al., 1981). It has been reported that evaluation of trunk extensor muscles has greater discriminative validity than evaluation muscle strength in low back pain (Biering Sorensen et al., 1984; Luotos et al., 1995; Kujata U M et al., 1996).

Apparent loss of muscle control following trunk muscle fatigue could be considered to be one of the important causes of low back

pain (Parnianpour M et al., 1998). Because these muscles are rich in larger diameter type I muscle fibers (Thorstensen A et al., 1987), they are suited to support low level of activity for long period of time. The decreased muscle endurance found in patients with low back pain to higher muscle metabolite level resulting from prolonged muscle tension and spasm, muscle deconditioning and inhibition of the paraspinal muscles (Armstrong R B et al., 1984; Roy S H et al.,1988) in response to pain and decreased activity.

Low back pain was managed using different exercise regimes which include flexion, extension, isometric flexion and intensive dynamic back extension. (Manniche et al., 1991, Mckenzie, 1985, Plum et al., 1985). Most of these exercises have not yield satisfactory results, although it is accepted that some form of exercises is better than none. (Martin et al., 1986, Mellin et al., 1984).

McKenzie exercises are considered as one of the best form of exercises for low back pain. During these exercises there will be postural correction is needed as well as observation of all changing in pain intensity and location. It can be start in acute pain and can be performed in all pain stages. (McKenzie 1998, Holdom 1995 & Donelson 1990).

McKenzie approach is not used to strengthen the back muscles, but to promote rapid symptom relief. A key principle is to teach the patient simple strategies to self-manage their pain. (Mc Kenzie 2003). McKenzie postural correction exercises for low back pain are beneficial treatment to maintain correct posture of spine that has been shown with better results in pain relief (Emela Mujic Skikc, 2003).

Among the abdominal muscles, the transverse abdominal, multifidus, and internal oblique muscles help to increase the intra-abdominal pressure, thereby contributing to the spinal and pelvic stability (Richardson et al., 2002, Hodges et al., 1997). Functional improvements and lumbar extensor strength at low lumbar flexion angles were both better in the stabilization exercise group, suggesting that these improvements were due to the stabilization exercises. (Panjabi et al., 1989).

Endurance training included low back extensors with internal muscles like multifidus, which help to prevent recurrence of low back pain. (Cholewicki et al., 1992). Role of the trunk stabilizers is to retain the control, coordination and to optimize the low back function. (Libenson et al., 1997).

Specificity of training applies to endurance training as much as to strength training. Research to determine how endurance training of

trunk muscles in persons with CLBP affects performance and function is sparse. Dynamic endurance may be need more than static endurance as most of the daily task involve dynamic movement (Leigh J.P. et al., 1989; Kisner., 1990). (Rissanen et al., 2002) reported that good trunk endurance may protect against back pain in workers suggesting subliminally of negative relations between the trunk extensor endurance and disability. Study conducted by Ganer Naveen et al., 2014 shown a strong relation ship of trunk extensor endurance and disability in low back pain. The study conducted (Chidozie E. Mbada et al., 2011) on the dynamic endurance exercise on long term low back pain lead to higher reduction in the activity limitation. The dynamic back extensors endurance exercise also involves repeated movement of trunk and limb in the saggital plane, therefore higher treatment outcome as most of the daily activates required movement. Trunk muscle endurance can be improved by exercises with static loads. (Moffroid et al., 1993). Graded activity programmes (Lindstrom et al., 1992) and leisure activities.(Salminen et al., 1993).

Muscle activation is impaired in patients with chronic low back pain and is thought to contribute to spinal instability, which may be causing the patients symptoms to persist. The dynamic exercises play

a major role in restoring the normal function of the muscles and to enhance spinal stability and also assist in decreasing pain and dysfunction. (Mc Gill et al., 1999).

Few authors have studied that group of women without low back pain who exercised 5 times per week. In these studies, a higher-intensity exercise was generally used as compared with their study; therefore, there may have been an increased likelihood of improved function.(Kahanovitz 1987). Pain may have inhibited an optimum exercise training stimulus. If the exercise stimulus is relatively low, such as that demonstrated in the submaximal exercise program of our study, increased oxidative capacity may or may not have resulted (Liber 1993).

In this study the subjects in Group A, underwent McKenzie postural correction exercise and dynamic endurance exercises programme through a set of exercise protocol which was formulated by Department of Physiotherapy, K.G. Hospital. All the subjects in the group underwent six weeks of training programme. Following the treatment, their pre test values and the post test values were calculated and analyzed for the results.

Group B subjects underwent postural correction education and general exercises programme, the protocols were formulated by department of physiotherapy, K.G.Hospital. All the subjects in the group underwent six weeks of training programme. Following the treatment, their pre test values and the post test values were calculated and analyzed for the results.

Based on the statistical analysis the result of the study shows that the combined McKenzie postural correction and dynamic endurance exercises was very effective in reducing pain and functional disability and increase in trunk muscle endurance with chronic postural low back pain. The treatment regimen of Mckenzie and dynamic endurance exercise may have possible stimulating and reactivating effect on the inhibited muscles of the back extensors caused by postural low back pain. This is because skeletal muscle tissues adapts to higher level of stimulus. Furthermore most of daily activities require movements. Loss of movements often due to splinting or guarding from pain and any exercise with movement elements carried out in pattern similar to daily task motions might help to reduce activity limitations (Chidozie E. Mbada et al., 2011). Thus the pretest and post test values of both the groups had shown that the

study done on the effect of Mckenzie postural correction and dynamic trunk muscle endurance exercises shown a better decrease on pain, disability and an increase in trunk muscle endurance in chronic postural low back pain.

VI. SUMMARY AND CONCLUSION

The purpose of the study was to find out the effect of Mckenzie postural correction and dynamic trunk muscle endurance exercises on pain, disability and trunk muscle endurance in chronic postural low back pain.

A total of 40 subjects with postural low back pain at age group of 21 to 35 years were selected by using systematic random sampling method. These subjects were divided into two groups, 20 subjects in each group. Group A subjects underwent Mckenzie postural correction along with dynamic trunk muscle endurance exercises for the duration of 6 weeks. Group B subjects received postural correction education and general exercises alone for the duration of 6 weeks.

Following six weeks of intervention, the outcome measures were scored. Pain was assessed using Visual Analogue Scale whereas Functional Disability was assessed using Oswestry Disability Scale and Muscle endurance was assessed using Modified Sorensen Test.

Paired‘t’ test was used to find out the improvement within the groups. Unpaired‘t’ test was used to find out the difference between the groups.

Based on this statistical analysis Group A subjects shown a significant improvement than Group B subjects.

Thus the study concluded that the Mckenzie postural correction and dynamic trunk muscle endurance exercises helps in reducing pain and improving functional disability and trunk muscle endurance in chronic postural low back pain.

VII. LIMITATIONS AND RECOMMENDATIONS

LIMITATIONS

- Study was focused only on chronic postural low back pain.
- Study was done in small population, larger population can bring better results.
- All participants in this study are software professionals, who use only desktop computers.
- Short term follow up was made.
- Certain factors like medication, psychological factors, sleeping pattern, work activities, travel were not controlled during the test period.

RECOMMENDATIONS

- Further studies should include other manual therapy techniques.
- Long term effect of the postural correction exercises should be examined
- Other factors like work station modification, job modification or ergonomic interventions can be included.
- Other occupations can be considered in future studies.
- Future study focus on identifying effect of one exercise over another.
- Future studies focus on involving other syndromes in the management of low back pain.

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APPENDICES

APPENDIX I

ASSESSMENT

Date:

Name:

Age:

Sex:

Date of birth:

Work: mechanical stresses:

Leisure: mechanical stresses:

Chief complaints:

Present medical history:

Past medical history:

Surgical history:

Drug history:

Family history:

Personal history:

Socioeconomic status:

Pain history:

Site:

Side:

Onset:

Duration:

Type:

Nature:

Frequency:

Aggravating factors:

Relieving factors:

Irritability:

Sleep disturbances:

Pain intensity:

Associated problems:

Vital signs:

ON OBSERVATION:

Built:

Posture:

Attitude of limbs:

Scars:

Deformity:

Bony prominences:

Tropical changes:

Muscle wasting:

External appliances:

ON PALPATION

Warmth:

Tenderness:

Trigger points:

Oedema:

ON EXAMINATION:

Higher cortical function:

Motor assessment

Range of motion:

Muscle

Muscle tone:

Muscle power:

Muscle girth:

Muscle tightness:

Joint

Joint circumference:

Accessory movements:

End feel:

Deformity:

Sensory assessment:

Reflex:

Limb length:

Hand function:

Gait assessment:

Functional assessment:

Special tests:

Investigations:

Provisional diagnosis:

Physiotherapy aims:

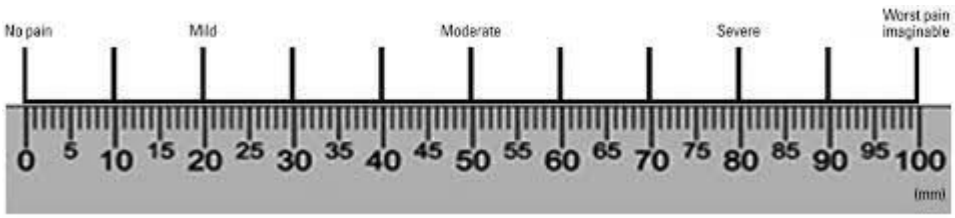
Home advice:

Follow

APPENDIX II

VISUAL ANALOGUE SCALE

It is used to measure the intensity of the pain. It is 0 to 100 mm scale, where 0 indicates no pain, 100 indicate severe pain and 50 indicate moderate pain. Examiner asks the patient to touch appropriate level depending on his perception of pain.



APPENDIX III

Oswestry Low Back Pain Disability Questionnaire

Oswestry Disability Index

Purpose:

The Oswestry Disability Index is also known as Oswestry low back pain disability questionnaire. It is an extremely important tool that the researchers and disability evaluators use to measure a patient's permanent functional disability. The test has been around for 25 years and is considered the 'gold standard 'of the low back pain functional outcome tool.

It is based on 10 questions, each followed by six alternatives. Each question scored from 0-5, where 0 is no difficulty and 5 is maximal difficulty, the sum of the scores is then expressed as a percentage.

Please answer each section below by checking the One Choice that applies the most to you at this time. (You may feel that more than one of the statement relates to you at this time, but it is very important that you please check only one choice that best describes your problem at this time.)

Section 1: Pain Intensity

- I can tolerate the pain I have without having to use pain killers. [0 points]
- The pain is bad but I manage without taking pain killers. [1 point]
- Pain killers give complete relief from pain. [2 points]
- Pain killers give moderate relief from pain. [3 points]
- Pain killers give very little relief from pain. [4 points]
- Pain killers have no effect on the pain and I do not use them. [5 point]

Section 2: Personal Care

- I can look after myself normally without causing extra pain. [0 points]
- I can look after myself normally but it causes extra pain. [1 point]

- It is painful to look after myself and I am slow and careful. [2 points]
- I need some help but manage most of my personal care. [3 points]
- I need help every day in most aspects of self-care. [4 points]
- I do not get dressed wash with difficulty and stay in bed. [5 points]

Section 3: Lifting

- I can lift heavy weights without extra pain. [0 points]
- I can lift heavy weights but it gives extra pain. [1 point]
- Pain prevents me from lifting heavy weights off the floor but I can manage
- If they are conveniently positioned for example on a table. [2 points]
- Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned. [3 points]
- I can lift only very light weights. [4 points]
- I cannot lift or carry anything at all. [5 points]

Section 4: Walking

- Pain does not prevent me walking any distance. [0 points]
- Pain prevents me walking more than 1 mile. [1 point]
- Pain prevents me walking more than 0.5 miles. [2 points]
- Pain prevents me walking more than 0.25 miles. [3 points]
- I can only walk using a stick or crutches. [4 points]
- I am in bed most of the time and have to crawl to the toilet. [5 points]

Section 5: Sitting

- I can sit in any chair as long as I like. [0 points]
- I can only sit in my favorite chair as long as I like. [1 point]
- Pain prevents me sitting more than 1 hour. [2 points]
- Pain prevents me from sitting more than 0.5 hours. [3 points]
- Pain prevents me from sitting more than 10 minutes. [4 points]
- Pain prevents me from sitting at all. [5 points]
- **Section 6: Standing**
- I can stand as long as I want without extra pain. [0 points]
- I can stand as long as I want but it gives me extra pain. [1 point]
- Pain prevents me from standing for more than 1 hour. [2 points]
- Pain prevents me from standing for more than 30 minutes. [3 points]

- Pain prevents me from standing for more than 10 minutes. [4 points]
- Pain prevents me from standing at all. [5 points]

Section 7: sleeping

- Pain does not prevent me from sleeping well. [0 points]
- I can sleep well only by using tablets. [1 point]
- Even when I take tablets I have less than 6 hours sleep. [2 points]
- Even when I take tablets I have less than 4 hours sleep. [3 points]
- Even when I take tablets I have less than 2 hours of sleep. [4 points]
- Pain prevents me from sleeping at all. [5 points]
- **Section 8: Sex Life**
- My sex life is normal and causes no extra pain. [0 points]
- My sex life is normal but causes some extra pain. [1 point]
- My sex life is nearly normal but is very painful. [2 points]
- My sex life is severely restricted by pain. [3 points]
- My sex life is nearly absent because of pain. [4 points]

- Pain prevents any sex life at all. [5 points]

Section 9: Social Life

- My social life is normal and gives me no extra pain. [0 points]
- My social life is normal but increases the degree of pain. [1 point]
- Pain has no significant effect on my social life apart from limiting energetic interests such as dancing. [2 points]
- Pain has restricted my social life and I do not go out as often. [3 points]
- Pain has restricted my social life to my home. [4 points]
- I have no social life because of pain. [5 points]

Section 10: travelling

- I can travel anywhere without extra pain. [0 points]
- I can travel anywhere but it gives me extra pain. [1 point]
- Pain is bad but I manage journeys over 2 hours. [2 points]
- Pain restricts me to journeys of less than 1 hour. [3 points]
- Pain restricts me to short necessary journeys under 30 minutes. [4 points]
- Pain prevents me from traveling except to the doctor or hospital. [5 points]

Interpretation: Simply add up your points for each section and plug it in to the following formula in order to calculate your level of disability: **point total / 50 X 100 = % disability.**

ODI Scoring: 0% to 20% (minimal disability)

21%-40% (moderate disability)

41%-60% (severe disability)

61%-80% (crippled)

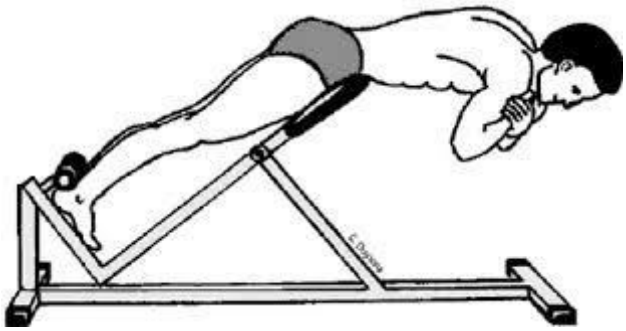
81%-100%: These patients may be bed bound or exaggerating their symptoms.

APPENDIX IV

MODIFIED SORENSEN TEST

It is the most widely used test in published studies evaluating the isometric endurance of the trunk extensor muscles.

Procedure: subject lay prone on a padded examination table, with trunk of the body extended off the edge of the table at the level of anterior superior iliac spines of the pelvic, lower legs, thigh and mid-buttocks region were restrained from motion using wide straps attached to the examination table. A pad placed under the ankles prevented subjects from bracing against table with their feet.



APPENDIX V

Group A : (Experimental group)

Mckenzie postural correction and postural education

Fig.1 : WRONG SITTING POSTURE

Fig. 2: OVER CORRECTED POSTURE

Fig .3: CORRECTED POSTURE

DYNAMIC ENDURANCE EXERCISES

Fig. 4: Both arms by the sides of the body and lifting the head and trunk off the plinth from neutral to extension.

Fig. 5: Shoulders are abducted to 90° and the elbows flexed, and lifting the head and trunk off the plinth from neutral to extension.

Fig. 6: Both arms elevated forwards, and lifting the head, trunk and elevated arms off the plinth from neutral to extension.

Fig.7: Lifting the head, trunk and contralateral arm and leg off the plinth from neutral to extension.

Fig. 8: Both shoulders abducted and elbows flexed to 90° and lifting the head, trunk and both legs (with knees extended) off the plinth.

Group B: (Control group)

General exercises

Fig.1: Alternate knee to chest

Fig. 2: Straight leg raising

Fig.3: Pelvic bridging

Fig. 4: Alternate arm –leg extension

Fig. 5: Postural correction education

APPENDIX VI

PATIENT CONSENT FORM

I, ……voluntarily consent to participate in the project named **"EFFECT OF MCKENZIE POSTURAL CORRECTION AND DYNAMIC TRUNK ENDURANCE EXERCISES ON PAIN, DISABILITY AND TRUNK MUSCLE ENDURANCE IN CHRONIC POSTURAL LOW BACK PAIN"**

The candidate has explained to me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Participant's Signature :

Signature of witness :

Signature of candidate :

Date :